

REMARKS

Reconsideration and allowance in view of the foregoing amendments and the following remarks is respectfully requested.

By this Amendment, claims 1, 2, 14, 17-19 and 21-22 are amended. Furthermore, claims 1-11, 13, and 15-16 are canceled without prejudice or disclaimer. Accordingly, claims 12, 14, and 17-22 are pending in this application.

The Patent and Trademark Office (PTO) objects to claims 1-22 because of informalities. In addition, claims 12-22 are rejected under 35 USC §103(a) as being unpatentable over *Morrison* (US 5,113,286) in view of the patent issued to *Wiki* (PN. 6,922,287). In response, the claims are amended and believed to be patentable for the reasons discussed below.

Claim Objections

Applicants amend claims 12 removing reference to the fill factors as a function. Furthermore, claim 12 is amended to include the subject matter of claim 13, and claim 13 is canceled, rendering the objection thereto moot. In addition, claims 19-21 are amended to correct the dependencies thereof. Accordingly, withdrawal of the objection to the claims is respectfully requested.

Rejections under 35 U.S.C. §103(a)

Claim 12 is amended, and as presented below, is believed to be patentable over the applied art for the failure of the applied art to not only disclose, teach or suggest all of Applicants' recited claim features, but in addition fails to present any apparent reason to combine references or modify prior art to create the Applicants' allegedly obvious claim elements, the grounds of rejection constituting an improper reconstruction of Applicants' claimed invention.

As amended, claim 12 recites, *inter alia*, wherein:

- the first and second geometry types are respectively pillar, and hole (see page 12, lines 9-13, of the specification); and
- the increasing and decreasing of the indices are with regards to a same direction axis, (see Figs. 9a and 10a-10d, of the specification).

Applicants respectfully submit that the asserted combination of references fails to disclose, teach, or suggest at least these features of claim 12.

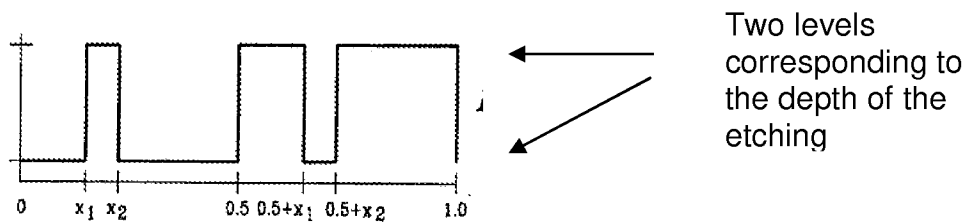
At the outset, *Morrison*:

- does not relate to the sub-wavelength domain; and
- does not disclose, teach, or suggest the use of effective indices of pillars and holes in order to synthesize a diffractive optical element.

Furthermore, *Morrison* appears to only disclose a binary level structure to realize a binary phase function and a multi-level structures to realize a plurality of phase levels, wherein the etched pattern may comprise L levels (see Fig. 20, 23, 24), to encode L phases.

Still further, notwithstanding the indications, in paragraph 4 of the Office Action, that Figs. 8-11 of *Morrison* discloses pillars or holes, as recited in claim 12, Applicants respectfully submit that Figs. 8-11 appear to only depict three periods of an amplitude pattern that would be used to produce gratings having specific spot arrays. The gratings 42 disclosed by *Morrison* in Fig. 4 clearly do not disclose, teach, or suggest the recited pillars or holes, and furthermore, nowhere does *Morrison* indicate pillars or holes, let alone a blazed diffraction grating having a blaze effect over a spectral range.

Furthermore, as shown below, Fig.7 of *Morrison* depicts a binary structure having two levels to code a phase function having two phase levels, i.e., 0 and π , wherein the phase ϕ is a function of $h(x)$: $\phi = 2 * \pi * n * h(x) / \lambda$, where $h(x) = t$ or 0 as a function of x .



To code a multi-level phase's function, *Morrison*, in Fig. 23, appears to use several different heights with four different heights, each coding a phase value:

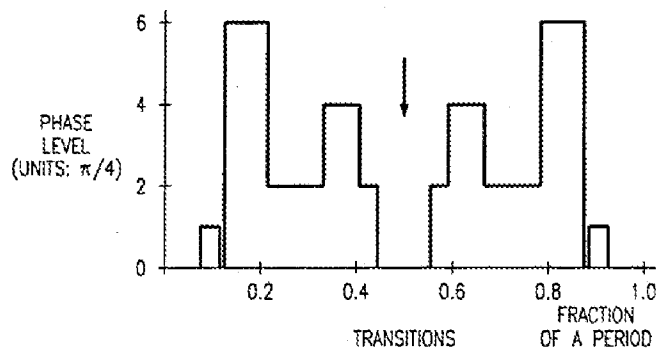
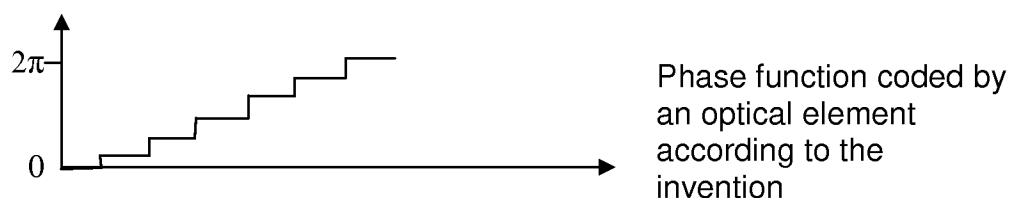


FIG. 23

Applicants' recited invention is distinguished from *Morrison* in that the phase is coded by a variation of the effective indices, while the height of the structures remains constant:

$$\phi = 2 * \pi * n_{\text{effectif}}(x) * h / \lambda \text{ où } h = \lambda / (n_{\text{eff}_{\text{max}}} - n_{\text{eff}_{\text{min}}})$$

Thus, although the recited device comprises a structure having holes or pillars of a constant height, equivalent to two levels, it synthesizes a phase function having generally more than two phase levels. These multiple phase levels, illustrated below, are obtained by use of effective indices as recited in claim 12.



Regarding *Wiki*, the Office Action appears to rely upon *Wiki* to suggest that a diffraction grating having microstructures of pillar geometry (Fig. 6), is really analogous to diffraction grating having hole geometry (Fig. 7, column 5, lines 44-50, of *Wiki*). Applicants respectfully disagree and further submit that the domain of *Wiki* is not the domain of the invention.

Nowhere does *Wiki* appear to disclose an optical structure configured to synthesise a phase function. Applicants respectfully submit that *Wiki* appears to only disclose a use of 2D structures to increase an evanescent electronic field, so that more fluorescent molecules can be excited.

The optical structures of Figs 6 and 7, as used in *Wiki*, appear to be exactly periodic, using structures, pillars (Fig.6) or holes (Fig.7), having exactly the same size. Notwithstanding the Applicants position that the combination of *Morrison* and *Wiki* is improper, even if the applied references were combined, one of ordinary skill in the art would juxtapose a periodic array of pillars having all the same size (Fig.6) and a periodic array of holes having all the same size (Fig.7).

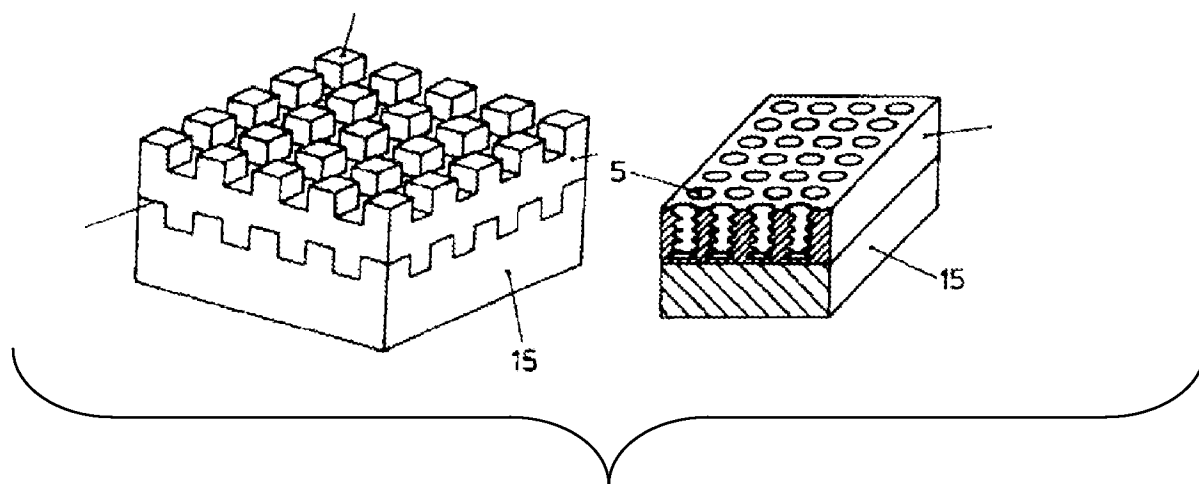
Applicants respectfully submit that the asserted combination of references present no apparent reason to combine references or modify prior art in any other manner to create the Applicants' allegedly obvious claim elements.

Making a reasoning based on the notion of artificial material, juxtaposing the two structures of Figs.6 and 7 is equivalent to join two materials having two effective indices, n_1 and n_2 as shown on the attached drawing.

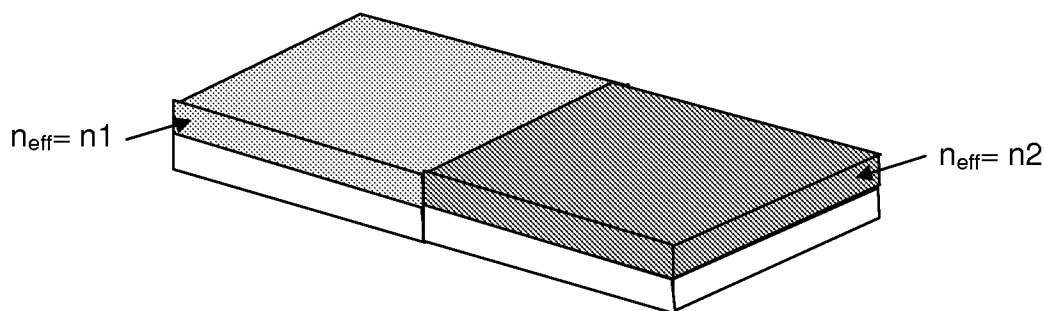
The two effective indices n_1 and n_2 depends on the period and the size of the structures. Applicants respectfully submit that there is no possible application of such an artificial material in the domain of diffractive optic or for the synthesis of a phase

function.

Therefore, Applicants respectfully submit that *Wiki* teaches away from the claimed invention.

FIG.6 of *Wiki*FIG.7 of *Wiki*

Equivalent to



Thus, Applicants respectfully submit that independent claim 12 is patentable not only due to the failure of *Morrison* in view of *Wiki* to disclose, teach or motivate all recited features of claim 12, but are also patentable based upon the improper combination of the applied references. Claims 14 and 17-22 depend from this independent claim and are likewise patentable over the asserted combination of references for at least their dependence on an allowable base claim, as well as for the additional features they recite. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

All objections and rejections having been addressed, it is respectfully submitted that the present application should be in condition for allowance and a Notice to that effect is earnestly solicited.

The Examiner is invited to telephone the undersigned, Applicant's attorney of record, to facilitate advancement of the present application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 07-1337 and please credit any excess fees to such deposit account.

Respectfully submitted,

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